Messrs. George and Jobling; both these machines possess interesting features in the matter of control. There are also monoplanes by the Star Engineering Co., Ltd., of Wolverhampton, and by Handley Page, Ltd., of London.

It is quite impossible to deal adequately with all the points of interest in the exhibition. That its success is assured, and that its effects will be far-reaching, are evidenced by the large numbers of visitors, most of whom appeared to be keenly interested and full of inquiries.

EXPLORATIONS IN THE GLACIER TRIBUTARIES OF THE SHAYOK RIVER, KASHMIR TERRITORY.

In the *Times* of December 21, 1909, reference was made to certain discoveries by a party consisting of Dr. E. G. Longstaff, Dr. A. Neve, and Lieut. A. M. Slingsby in the Kashmir Himalaya. The *Geographical Journal* of November, 1909, also had an article, based upon an account of the tour, written by Dr. Neve in the *Times of India* of September 4. A few remarks concerning the addition to Himalayan geography referred to in these communications may be of interest.

The topography of this part of Baltistan requires explanation; if the atlas sheets are examined, it will be seen how very few trigonometrical points are to be found east of longitude 77°. They are much fewer than in the portion of Baltistan I had to survey on the Lower Shayok and Indus, and the branches of the Shigar tributary of the latter river. The difficulties of penetrating into these out-of-the-way valleys were very great, and it was almost a superhuman task for Mr. Ryall and other assistants to produce, in the limited time given them, a better or more accurate idea of its geographical features. Very few of the glaciers were followed up, or can be followed up, so their sources were merely sketched in by eye from a distance. Very many tributaries are inaccessible, either from their rocky, wall-like sides, or the stream being too deep and rapid to ford, there being no bridges, or the means of making them. Thus the topography can only be classed as rough reconnaissance. The Saichar valley and its glacier was not ascended far, if at all, and even the distance and size Mr. Ryall assigned to it some twelve miles N.W. from Saichar would in nature appear to be its total length; it probably has a bend, and if straight a distant ice fall, or a local narrowing might give the appearance of a watershed. I have not heard of Mr. Ryall for very many years; if he is still living he would be able to tell us whether he ascended the glacier to any distance. His field book, if it is to be found, would give much information as to where he went. There would be his boiling-point observations, and the notes he made in it.

There can be no absolute accuracy in the topography at the head of the Kondus Valley, south-east of Snowy Peak K. This valley, I would point out, is well worthy of further exploration, because it is possible some high point on its eastern side could be reached from which a view would be obtained of the higher portion of the newly-discovered Terim Glacier and the snowy range which bounds it on the north-eastward. Concerning the Terim Glacier extension of the Saichar, the discovery alters the position of the main range, which may be taken as fairly well laid down up to lat. 25° 30', long. 77° 30'. North of lat. 35° 30' up to about lat. 35° 45' and long. 77° has certainly to be mapped. This is some forty-five to fifty miles in length, and lies fifteen miles or more further to the north and eastward. It is to be hoped that Colonel Long, the present Surveyor-General of India, will see his way to depute one or two of his best officers to extend the triangulation, fix more points, and accurately lay down this corner on a plane table—an attractive, delightful summer's work for someone.

That very high peaks in this corner, lying to the east of K2 and Gusherbrum, escaped the view of the triangulators when they were observing at the principal stations of the Indus River and Changchenmo series is not surprising. The high mass between the head of the Nubra River and the Shayok, 20,000 to 22,000 feet, would hide much. From trigonometrical stations east of Leh, the same portion of the main water parting is shut out by another lofty mass 22,000 to 25,000 feet, dominating the Shayok Valley on its northern side.

The Shayok series was a very short one, the stations of observation did not extend to lat. 35°, and from the two highest stations, Ajanliung, 19,903 feet, and Telthep, 19,705 feet, overlooking and south of the Shayok Valley, peaks at the head of the Saichar Glacier would not be visible owing to the intervening mountain masses.

A point of interest is the great length of the Terim Glacier, estimated at forty-four miles, next its position and direction, in connection with the trend of the ranges in Ladak and the mountain area both to the eastward and westward. This great glacier, as described, would appear to occupy a blank on the map, and, like a piece of a puzzle, exactly where it might be expected to fit in. This the topography at the head of the Saichar Glacier and the line of the main water parting did not previously indicate on the atlas sheet.

A valuable compilation was published in 1907, viz. "A Sketch of the Geography and Geology of the Himalaya Mountains and Thibet," by Colonel S. G. Burrard, R.E., F.R.S., superintendent Trigonometrical Survey, and H. H. Hayden, superintendent Geological Survey of India. In 1883—presidential address, Geographical Section, British Association—I made an attempt to bring the remarkable parallelism of the mountain ranges into some sort of systematic sequence from the plains up to the loftiest parts of the Himalayan chain. Correctness in detail was not to be expected over such an extended area, yet it is some satisfaction to find the general principle underlying my plans and sections has been accepted by officers of the Trigonometrical and Geological Surveys. My Shayok Kailas range they call the Kailas; for my Mustakh axis, which I considered one of the most important, they adopt that of Karakoram; but I am now inclined to think, from what Dr. Longstaff reports, that yet another well-marked elevated range is indicated by an extension of Younghusband's Aghils, on the northern side of the Oprang Valley, continued to Longstaff's new peak, 27,610 feet, about long. 77° and lat. 35° 30' (*vide Geographical Journal*, January, 1910, p. 65). I am doubtful if this assigned position is correct, for on the atlas sheet it is close to the head of the glacier called Sherpi Gang, in the Kondus Valley. The position long. 77° 20' and lat. 35° 40' given in the *Times of India* would appear to fit in best with the general account. The Karakoram pass and watershed lie some forty miles to the north-east of the Saichar Glacier, and must therefore fall on a still more northern axis of elevation, running in the direction of the Lingzhithang plain, and quite distinct from my Mustakh one.

From Leh the direction of the Ladak axis or range is indisputably to the south-east, and it leaves the Pangkong Lake and Rudok well to the north, but the west and east wrinkling exhibited in the ranges much further to the north has not been so definitely established owing to the absence at many points of geological data to link them up; this is particularly the case with the Karakoram pass and the country north of the Changchenmo range.

The topography of this area leads me to notice what is written in the above-mentioned work by Colonel Burrard and Dr. Hayden, part ii., p. 100:—"Even the great Karakoram peaks themselves seem to follow two alignments. The Masherbrum peaks and peak 63 or K12 (table v. of part i.) surmount a ridge parallel to that on which the peaks of K2 and Gusherbrum stand, and at a distance of ten miles from it." This feature can thus be explained.

The Masherbrum ridge westward from K6, 25,119 feet, the peak which the Duke of the Abruzzi ascended to 24,583 feet last summer, represents, together with the Mustakh Pass granite axis, one main broad line of elevation. The Baltoro Valley occupies the trough scoured by its glacier along the strike and junction of the stratified rocks of the Masherbrum side, which originally lay up against the granite, and may very possibly have been once continuous over it. The southern Masherbrum ridge is, in fact, only a secondary feature, the result of denudation.

I cannot say for certain what K2 is composed of—probably not granite, more likely of the metamorphic and stratified series coming in on the north of the axis. This may be explained in more detail.

The stratified rocks, schists and slates, limestones and sandstones, a series of enormous thickness, composing the

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Panjal and Zanskar systems, occupy, as it were, ellipsoid basins or long troughs in the granite, and crushed up against it. Lines of drainage often follow the line of junction, breaking through the basal granitoid rock at certain points. We find a very instructive section on the Panmah Glacier, further west, which has cut its way down through the main granite axis, having here a breadth of ten miles or so. Further up the glacier, at Drenmung, where it bends round to the north-west, this main source, the Nobundi Sobundi Glacier, lies parallel to the line of the main water parting between the Indus drainage and the Oprang Valley. The broad river of ice is bounded on the south-west by the granite, on the north-east by a great series of stratified rocks forming the elevated main range for many miles and dipping to the northward. The breadth of granite continues thence for fifteen miles south-east, and then another twenty-five miles east towards Gusherbrum, and comes in, in the Baltoro Valley, forming the wonderful spurs and peaks of its northern side. Across the breadth of the glacier, moraine after moraine, for some three miles, the precipitous southern flank of the Masherbrum Ridge rises, all of stratified rocks, and Gusherbrum, at the eastern end, appeared to be of the same series, but closer to their junction with the granite, and vertical.

At Gusherbrum, K6 and K, a slight change in the strike of the whole mountain mass takes place. The head of the Terim Glacier, according to Dr. Longstaff, extends up to Gusherbrum, and he has proved that this glacier is the head of Ryall's Saichar Glacier, which, so far as it is shown on the atlas sheet, has a direction N.W. to S.E., the line of valley trough being continued eastward in the Nubra to the junction of that river with the Shayok. There seems a probability, arising from the interesting fact mentioned by Dr. Neve of granite rocks on the south of the Terim Glacier, stratified rocks on the north, that the former correspond to those north of the Baltoro Valley, and that the stratified series from near Gusherbrum continues east and forms the water parting between the Oprang Valley and the Terim Glacier. If such be the case we have a continuous strike of granite along the Nubra River to Changlung, *vide* Lydekker's map, Memoirs of the Geological Survey, vol. xxii., thence to the Marse mik La, which I know, to Nyak Tso of the Pangkong, and so on towards the Aling Kangri range, leading into Dr. Sven Hedin's Trans-Himalaya.

To return to the Masherbrum ridge, this finds its counterpart further west, and is represented by those remarkable sharp-pointed peaks, No. 11, B16, and B15, on the east side of the Biafo Glacier. This great glacier and the Hisper, indicating the position of this Mustakh axis as far as Hunza Nagayr, is truly one of the most striking physical features to be met with in the Himalayan chain.

H. H. GODWIN-AUSTEN.

BOTANICAL PAPERS FROM CAMBRIDGE.[1]

THE six papers referred to below are the work of members of the vigorous school of botany (including palæobotany) which now flourishes at Cambridge.

(1) Miss Stephens's investigation, begun in the botanical laboratory of the South African College at the suggestion of Prof. Pearson, is of considerable importance. The Penæaceæ are a small order of heath-like shrubs, allied to the Daphne family, and limited to the south-western region of Cape Colony. Out of the five genera, three, represented by six species, have been examined, and have all been found to agree in the essential points.

The ovary has four carpels and four loculi, each of which contains from two to four anatropous ovules with two integuments. The embryo-sac is derived directly, without intermediate cell-formation, from its mother cell; hence the reduction-division takes place in the nucleus of the embryo-sac. Four nuclei are first formed, and then each of these divides into two. The four pairs of nuclei are usually found lying cross-wise, one pair at each end of the sac and the other two at the sides. Each pair then divides again; four free nuclei, one from each group, fuse to form the primary endosperm-nucleus, while the three remaining cells in the four groups assume more or less the arrangement and appearance of an egg-apparatus. Thus the mature embryo-sac normally contains four peripheral groups of cells, each group resembling an egg-apparatus, and four nuclei in the middle, fusing to form the endosperm-nucleus; occasional variations from the prevailing arrangement were observed. Usually it is the ovum belonging to the group nearest the micropyle which is fertilised. In the case of this apical group fertilisation has been repeatedly observed; there is no evidence that parthenogenesis occurs. The interesting question whether the quadruple endosperm nucleus is fertilised, as in typical angiosperms, by one of the male nuclei, has not yet been determined. The embryo is remarkable for the absence of a suspensor, the small development of the cotyledons in comparison with the bulky hypocotyl, and the absence of a root-cap up to the time when the seed is ripe.

The significance of the peculiar type of embryo-sac in this order (only paralleled, as yet, by a species of Euphorbia) is fully discussed. The interest of the question is enhanced by the consideration that the Penæaceæ appear to be a dying-out family, as suggested by their limited distribution, the non-germination of the seeds in culture, and the extreme rarity of seedlings in nature. The author sums up her conclusions as follows:—"This embryo-sac is probably to be regarded as a derived form, with all four megaspores included in its development, rather than as a primitive one. . . ." "It is suggested that in either case its endosperm is formed, like that of *Welwitschia*, by a fusion of potential gametes, all the nuclei in the sac being looked upon as potential or reduced gametes."

(2) The genus Saxegothæa is represented by a single species, a small, yew-like tree growing in wet woods on the upper slopes of the Chilian Andes. Mr. Stiles has made a detailed investigation of the anatomy of both vegetative and reproductive organs, and confirms the position usually assigned to the genus as a member of the Podocarpeæ, a tribe of taxoid conifers. At the same time, he finds many points in common between Saxegothæa and the Araucarieæ. He unnecessarily weakens his case by the statement that "Saxegothæa differs from the Araucarieæ in having the ovule inverted" (p. 218); the ovule is, of course, inverted in both groups alike.

The author concludes:—"Thus it would seem probable, as Lindley said in his first description of the plant [1851], that Saxegothæa is a transition of a remarkable kind between the Pinaceæ and the Taxaceæ." The conclusion is interesting, as it supports the view that the Coniferales are essentially a monophyletic stock.

(3) The authors, Messrs. South and Compton, were so fortunate as to have at their disposal a plant of the Mexican cycad, *Dioon edule*, no less than 120 years old; it had spent thirty years of its life in the Botanic Garden at Manchester. In so old a plant—65 cm. in height and 80 cm. in girth—the narrowness of the vascular zone was remarkable; it was only ½ cm. in thickness, one-fifteenth of the radius of the stem; this poor development of the conducting system is accounted for by the small number of leaves functional at one time, the slow rate of growth, and the xerophilous habit. The structure of the stem is normal as in Stangeria, showing none of the vascular anomalies characteristic of some other cycadaceous genera. Within the stem two dome-like systems of internal strands, running out into the withered peduncles of bygone cones, were observed. The authors accept Count Solms-Laubach's interpretation that the growth of the stem is sympodial; each cone terminates the main axis, while the stem is continued by one of a pair of opposite buds. The presence of *two* such buds (one being abortive) is a new

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[1] (1) The Embryo-sac and Embryo of certain Penæaceæ. By E. L. Stephens. (*Annals of Botany*, vol. xxiii., pp. 363–78; pl. xxv. and xxvi., July, 1909.)

(2) The Anatomy of *Saxegothaea conspicua*, Lindl. By W. Stiles. (*New Phytologist*, vol. vii., pp. 209–22; figs. 28–34, November, 1908.)

(3) Notes on the Anatomy of *Dioon edule*, Lindl. By F. W. South and R. H. Compton. (*Ibid.*, pp. 222–29; figs. 35–40, November, 1908.)

(4) On a Cone of *Calamostachys Binneyana*, Carruthers, attached to a Leafy Shoot. By H. Hamshaw Thomas. (*Ibid.*, vol. viii., pp. 249–60; pl. i. and figs. 31, 32, July, 1909.)

(5) The Morphology and Anatomy of *Utricularia brachiata*, Oliver. By R. H. Compton. (*Ibid.*, pp. 117–30; figs. 6–12, April, 1909.)

(6) On an Abnormal Gynæceum in *Stachys sylvatica*, Linn. By A. W. Bartlett. (*Ibid.*, pp. 138–42; figs. 16, 17, April, 1909.)

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